

# Translation

PATENT COOPERATION TREATY

PCT/EP2003/010194



## PCT

### INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 2135/Dr.Tbr/	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/EP2003/010194	International filing date (day/month/year) 13 September 2003 (13.09.2003)	Priority date (day/month/year) 06 November 2002 (06.11.2002)
International Patent Classification (IPC) or national classification and IPC C07C 327/22		
Applicant RÖHM GMBH & CO. KG et al.		

- This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 4 sheets, including this cover sheet.
- This report is also accompanied by ANNEXES, comprising:
  - ☒ (sent to the applicant and to the International Bureau) a total of 9 sheets, as follows:
    - ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
    - ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
  - ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) \_\_\_\_\_, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).
- This report contains indications relating to the following items:
  - ☒ Box No. I Basis of the report
  - ☐ Box No. II Priority
  - ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
  - ☐ Box No. IV Lack of unity of invention
  - ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
  - ☐ Box No. VI Certain documents cited
  - ☐ Box No. VII Certain defects in the international application
  - ☐ Box No. VIII Certain observations on the international application

Date of submission of the demand 21 April 2004 (21.04.2004)	Date of completion of this report 27 January 2005 (27.01.2005)
Name and mailing address of the IPEA/EP	Authorized officer
Facsimile No.	Telephone No.

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/EP2003/010194

Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

- ☐ This report is based on translations from the original language into the following language \_\_\_\_\_, which is language of a translation furnished for the purpose of:
- ☐ international search (under Rules 12.3 and 23.1(b))
- ☐ publication of the international application (under Rule 12.4)
- ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

- ☒ The international application as originally filed/furnished
- ☒ the description:
- pages \_\_\_\_\_ 1-61 \_\_\_\_\_, as originally filed/furnished
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- ☒ the claims:
- pages \_\_\_\_\_, as originally filed/furnished
- pages\* \_\_\_\_\_, as amended (together with any statement) under Article 19
- pages\* 1-25 received by this Authority on 27 December 2004 (27.12.2004)
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- ☐ the drawings:
- pages \_\_\_\_\_, as originally filed/furnished
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- ☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheets/figs \_\_\_\_\_
- ☐ the sequence listing (*specify*): \_\_\_\_\_
- ☐ any table(s) related to sequence listing (*specify*): \_\_\_\_\_

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheets/figs \_\_\_\_\_
- ☐ the sequence listing (*specify*): \_\_\_\_\_
- ☐ any table(s) related to sequence listing (*specify*): \_\_\_\_\_

\* If item 4 applies, some or all of those sheets may be marked "superseded."

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/EP 03/10194

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

### 1. Statement

Novelty (N)	Claims	9-16	YES
	Claims	1-8, 17-25	NO
Inventive step (IS)	Claims	9-16	YES
	Claims	1-8, 17-25	NO
Industrial applicability (IA)	Claims	1-25	YES
	Claims		NO

### 2. Citations and explanations

D1: WO 03/011926 A (PPG INDUSTRIES OHIO, INC.)

13 February 2003 (2003-02-13)

D2: WO 03/011925 A (PPG INDUSTRIES OHIO, INC.)

13 February 2003 (2003-02-13)

D6: WO 03/046028 A (ESSILOR INTERNATIONAL COMPAGNIE  
GENERAL D'OPTIQUE) 5 June 2003 (2003-06-05)

D8: US-B1-6 342 571

1. The subject matter of claims 1 to 8 and 17 to 25 is no longer novel with respect to D8; see column 5, line 9, to column 6, line 10; column 15, line 59, to column 17, line 45; column 13, lines 36 to 64, and the claims.

2. The mixtures according to claims 9 to 16 differ from those according to D8 by the presence of the specified thiourethane compounds. Therefore the subject matter of claims 9 to 16 is novel.

3. The mixtures according to claims 9 to 16 can be polymerized to form materials having favourable optical properties. Therefore the subject matter of these claims involves an inventive step.

4. D1, D2 and D6 have an earlier priority date than the present application and are therefore relevant to novelty in the European Patent System. They contain

**INTERNATIONAL PRELIMINARY EXAMINATION REPORT**

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disclosure which is prejudicial to the novelty of  
the subject matter of the current claims.

REPLACED BY  
ART 34 AMDT

10/529478

JC06 Rec'd/PTO 28 MAR 2005

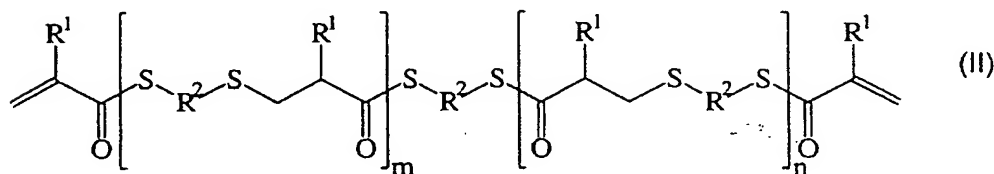
**THE FOLLOWING IS THE ENGLISH TRANSLATION OF THE  
ARTICLE 34 AMENDED SHEETS (Pages 48-54a)**

Attachment to our letter to the EPO dated 22.12.2004 concerning  
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# Claims

1. Mixture containing

5 A) compounds of the formula (I) and (II)



10 where R<sup>1</sup> is independently at each instance  
hydrogen or a methyl radical,  
R<sup>2</sup> is independently at each instance a linear or  
branched, aliphatic or cycloaliphatic radical  
and  
m and n are each independently an integer of  
15 not less than 0 subject to the proviso that  
m + n > 0,  
and

20 B) at least one ethylenically unsaturated monomer  
(A) which is different from the compounds of  
the formula (I) and (II).

2. Mixture according to Claim 1, characterized in  
that it contains more than 10 mol%, based on the  
25 total amount of compounds of the formula (I) and  
(II), of compounds of the formula (II) where  
m+n=2.

3. Mixture according to Claim 1 or 2, characterized

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in that the radical  $R^2$  is an aliphatic radical  
having 1 to 10 carbon atoms.

4. Mixture according to at least one of the preceding  
5 claims, characterized in that it contains more  
than 5.8 mol%, based on the total amount of the  
compounds of the formula (I) and (II), of  
compounds of the formula (II) where  $m+n=3$ .
- 10 5. Mixture according to at least one of the preceding  
claims, characterized in that it contains 0.1 to  
50.0 mol%, based on the total amount of the com-  
pounds of the formula (I) and (II), of compounds  
of the formula (I).
- 15 6. Mixture according to at least one of the preceding  
claims, characterized in that it contains more  
than 30 mol%, based on the total amount of the  
compounds of the formula (I) and (II), of com-  
20 pounds of the formula (II) where  $m+n=1$ .
7. Mixture according to at least one of the preceding  
claims, characterized in that it contains  
compounds of the formula (II) where  $m+n>3$ .
- 25 8. Mixture according to one or more of the preceding  
claims, characterized in that the total  
fraction of compounds of the formula (I) and (II)  
is at least 5.0% by weight, based on the total  
30 weight of the mixture.
9. Mixture according to at least one of the preceding  
claims, characterized in that it contains at least  
one thiourethane compound (T) as monomer (A), said  
35 compound (T) being in turn obtainable by

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- a) reaction of one equivalent of at least one  
diisocyanate of the formula (X)



where

- 5  $\text{R}^9$  is a linear or branched aliphatic or  
cycloaliphatic radical,

with

$v_D$  equivalents of a dithiol of the general  
formula (XI)



where

$v_D$  is from 0.1 to 0.9,

$\text{R}^{10}$  is a linear or branched, aliphatic or  
cycloaliphatic radical,

- 15 or

$v_D$  equivalents of a mixture comprising at  
least one dithiol of the general  
formula (II) and at least one compound of  
the general formula (V)



where

$\text{R}^{11}$  is a linear or branched, aliphatic or  
cycloaliphatic radical,

Z is oxygen or sulphur,

- 25 in the presence of a catalytically effective  
amount of a known urethane chemistry catalyst,  
especially pyridine, diazobicyclo(2.2.2)octane,  
collidine and/or picoline

- 30 b) reaction - in the presence of customary  
reaction-catalyzing and -stabilizing compounds  
- of at least one  $\alpha,\omega$ -difunctional thiourethane  
compound of step a)

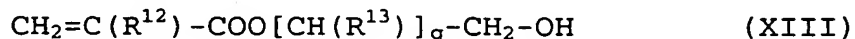
with

- 35  $v_H$  equivalents of at least one hydroalkyl  
(meth)acrylate of the general



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formula (XIII)



where

$$v_H = 2 - 2 * v_D,$$

- 5         $\text{R}^{12}$  is hydrogen or a methyl radical,  
       $\text{R}^{13}$  is hydrogen or a linear or branched alkyl  
          radical having 1 to 4 carbon atoms, and  
       $q$  is a positive integer from 1 to 3.

- 10    10. Mixture according to Claim 9, characterized in  
      that the radical  $\text{R}^{13}$  is hydrogen.
11. Mixture according to Claim 9 or 10, characterized  
      in that the hydroxyalkyl (meth)acrylate(s) of the  
15    formula (XIII) are 2-hydroxyethyl methacrylate,  
      2-hydroxyethyl acrylate, 4-hydroxybutyl  
      methacrylate and 4-hydroxybutyl acrylate.
12. Mixture according to one or more of Claims 9 to  
20    11, characterized in that the radical  $\text{R}^9$  is an  
      aliphatic radical having 2 to 9 carbon atoms.
13. Mixture according to one or more of Claims 9 to  
      12, characterized in that the radical  $\text{R}^{10}$  is an  
25    aliphatic radical having 1 to 10 carbon atoms,  
      preferably a linear aliphatic radical having 2 to  
      8 carbon atoms.
14. Mixture according to one or more of Claims 9 to  
30    13, characterized in that it contains at least one  
      ethylenically unsaturated monomer (B) which is  
      different from the thiourethane compound (T), as a  
      monomer (A).
- 35    15. Mixture according to Claim 14, characterized in  
      that that at least one ethylenically unsaturated

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monomer (B) is a (meth)acrylate of the  
formula (XIV)

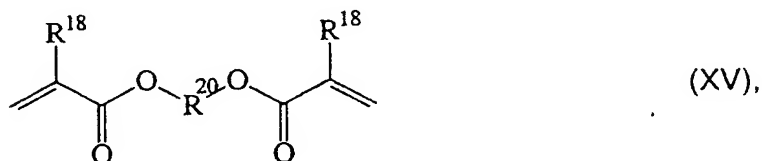


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where  $\text{R}^{18}$  is hydrogen or methyl and  $\text{R}^{19}$  is a  
linear or branched alkyl or cycloalkyl radical  
having 1 to 40 carbon atoms,

10

a di(meth)acrylate of the formula (XV)



15

where  $\text{R}^{18}$  is independently at each instance  
hydrogen or methyl and  $\text{R}^{20}$  is a linear or branched,  
aliphatic or cycloaliphatic radical or a radical  
of the general formula (XVa)



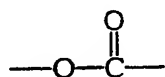
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where  $\text{R}^{22}$  is a linear or branched, aliphatic  
or cycloaliphatic radical,  $z$  is an integer  
between 1 and 1000,

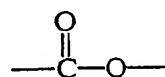
25

$\text{R}^{21}$  is independently at each instance a linear  
or branched, aliphatic or cycloaliphatic  
radical and  $\text{X}^1$  is independently at each  
instance hydrogen or sulphur, an ester group  
of the general formula (XVb), (XVc)

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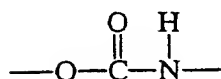
(XVb)



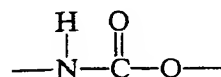
(XVc)

a urethane group of the general formula (XVd),  
(XVe), (XVf) or (XVg)

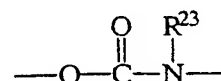
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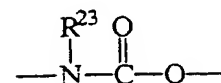
(XVd)



(XVe)



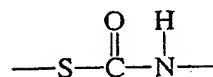
(XVf)



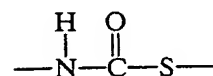
(XVg)

a thiourethane group of the general formula  
(XVh), (XVi), (XVj) or (XVk)

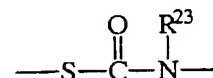
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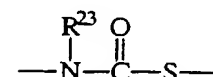
(XVh)



(XVi)



(XVj)



(XVk)

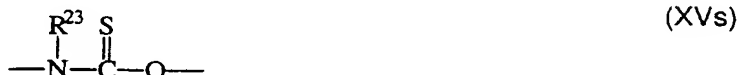
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a dithiourethane group of the general formula  
(XVl), (XVm), (XVn) or (XVo)



5

or a thiocarbamate group of the general formula  
(XVp), (XVq), (XVr) or (XVs)



10

where R<sup>23</sup> is a linear or branched, aliphatic or  
cycloaliphatic radical,  
and/or styrene.

- 15 16. Mixture according to Claim 15, characterized in  
that the monomer (B) is a di(meth)acrylate of the  
formula (XV).

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17. Process for producing a highly transparent plastic, characterized in that a mixture according to at least one of the preceding claims is polymerized.
18. Highly transparent plastic obtainable by a process according to Claim 17.
19. Highly transparent plastic according to Claim 16, characterized in that its DIN 53491 refractive index is greater than 1.6.
20. Highly transparent plastic according to Claim 17 or 18, characterized in that its DIN 53491 Abbe number is greater than 36.
21. Highly transparent plastic according to at least one of Claims 17 to 19, characterized in that its ISO 179/1fU Charpy impact toughness is greater than 3.0 kJ/m<sup>2</sup>.
22. Highly transparent plastic according to at least one of Claims 17 to 20, characterized in that its DIN 5036 transmission is greater than 88.5%.
23. Highly transparent plastic according to at least one of Claims 17 to 21, characterized in that its ISO 306 Vicat temperature is greater than 50.0°C.
24. Use of the highly transparent plastic according to at least one of Claims 17 to 22 as an optical lens, preferably as an ophthalmic lens.
25. Optical and especially ophthalmic lens comprising a highly transparent plastic according to at least one of Claims 17 to 22.